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Food & Nutrition Research News Briefs

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Nutrition and Health

Sugar junkies, beware! Another study shows that too much sugar can lift your cholesterol and fat levels as well as your spirits. The culprit is fructose, which accounts for half the sugar in table sugar (sucrose) and more than half in high-fructose corn sweeteners. When combined with a diet high in saturated fat and cholesterol, fructose significantly increased several danger signs for coronary artery disease in 21 men. The men consumed diets containing 20% fructose--about twice the level in an average diet--and 20% starch. On the high-fructose diet, the men had significant increases in blood levels of total cholesterol, LDL (the "bad" cholesterol-carrying particle), and total triglycerides. As expected, the high-fructose diet caused the greatest increase in the 10 men who normally overreact to dietary sugar. Between 9% and 17% of the U.S. population is sugar sensitive--a condition thought to precede diabetes. Carbohydrate Nutrition Lab, Beltsville Human Nutrition Research Center, Beltsville, MD
Daniel J. Scholfield, (301) 344-2385

Vitamin E supplements may help promote heart disease rather than prevent it, as some researchers have suggested. Two recent studies found that the vitamin has an adverse effect on cholesterol-carrying lipoproteins--both the low-density (LDL) and high-density (HDL) types. It causes them to become more rigid. By contrast, a healthful, low-fat diet has the opposite effect: it makes both lipoproteins more fluid. This could mean that more cholesterol is deposited in the arteries by rigid LDL and less is removed by rigid

HDL. Large daily doses of E (600 international units) reduced LDL fluidity in women (no men were in this study). In a second study, moderate daily doses (30 and 100 i.u.) reduced HDL fluidity in women but not in men. Women taking 100 i.u. also had lower levels of the beneficial HDL after 6 weeks. Lipid Nutrition Lab, Beltsville Human Nutrition Research Center, Beltsville, MD
Elliott Berlin, (301) 344-2297

Breast-fed infants take in fewer calories and grow at a different rate than published national norms used by pediatricians nationwide, suggesting the norms need revising. The evidence stems from several independent and ARS studies of nursing infants, including a recent study of 45 infants from birth to 8 months of age. Their calorie intake slipped from 100% of the Recommended Dietary Allowance during their first month to 80% by their fourth month and remained at that level after solid foods were introduced. Growth rate reflected calorie intake. During their first 3 months, the infants grew 5% to 10% faster than projected by the National Center for Health Statistics growth standards, then dropped 3% to 4% a month. By the eighth month, these infants were about 17% below their starting level on the growth curve. Current RDA and growth standards are based on older data from predominantly formula-fed infant populations. This, plus the fact that today's formulas are more like mother's milk, suggests the need for a fresh look at the norms. Children's Nutrition Research Center, Houston, TX
Janice E. Stuff/Cutberto Garza, (713) 799-6178/6004

Sluggish enzymes may explain why alcohol hits older people quicker and harder than young people. In a study of old and young inebriated rats, some of the enzyme systems that dispose of ethanol and its toxic byproduct--acetaldehyde--were less active in the old rats. Forty percent of the old rats died from a large dose of alcohol, while all the young rats survived. Scientists have attributed the difference in sensitivity to the fact that older animals (and people) have less body water, increasing their alcohol concentration. However, these findings suggest that delayed alcohol elimination also contributes to acute and chronic alcohol toxicity in the elderly. Human Nutrition Research Center on Aging at Tufts, Boston, MA
Robert M. Russell, (617) 556-3335

Lactoengineering could become common practice for mothers nursing very low-birthweight infants. In the first attempt to manipulate breastmilk composition by changing the mother's diet, scientists tailored its fat content to the special needs of infants under 3-1/2 pounds. These infants have difficulty absorbing long-chain fatty acids (having 16 or more carbon units) common in the milk of mothers on a typical diet. When 10 mothers switched to a diet very low in fat and high in carbohydrates (80% of total calories compared with 45% in a typical diet), their breastmilk contained more medium-chain fatty acids. Since these have only 10 to 14 carbon units, they are more readily absorbed by very low-birthweight infants. Further studies will assess the benefits to infants. Children's Nutrition Research Center at Baylor, Houston, TX
Richard J. Schanler, (713) 799-4297

A 51-page report to Congress describing the U.S. Department of Agriculture's human nutrition research and education activities for fiscal year 1987 is now available. To obtain a copy, write to Dr. Gerald Combs, Rm. 132, Bldg. 005, BARC-West, Beltsville, MD 20705.

Determining whether the human body has enough vitamin B₆ is now faster and easier. A newly automated test, based on well-known chemical interactions between vitamin B₆ and red blood cell enzymes (alanine aminotransferase and aspartate aminotransferase), requires only a few drops of blood. The vitamin must be present for the enzymes to function, and the level of enzyme activity accurately indicates an individual's B₆ status. The improved procedure is simple to run and can analyze up to 100 samples a day with an automated chemistry analyzer, an instrument found in most labs. Most likely candidates for vitamin B₆ deficiency are females over the age of 15 and elderly men. Biochemistry Research, Western Human Nutrition Research Center, San Francisco
James H. Skala, (415) 556-5954

Tomorrow's Foods and Fibers

Bread made from processed oat hulls is now available commercially through Pepperidge Farms. An ARS-developed process turns cereal grain hulls, brans, and other heretofore undigestible plant parts into a no-calorie, high-fiber product that can replace up to half of the flour in baked goods and other foods. The additive does not change taste, texture, or baking qualities. In fact, the mixture of hemicellulose and cellulose fibers actually makes foods moister. The substance is made by treating oat hulls with hydrogen peroxide, which washes out the lignin, or woody portions of the plant, permitting humans to ingest the remaining fibers. Plant Polymer Research, Northern Regional Research Center, Peoria, IL
J. Michael Gould, (309) 685-4011

Cornbread, a tasty but crumbly accompaniment to ham and beans since colonial days, could take on smooth, uniform texture to become a new sandwich bread. Instead of coarse-ground corn meal, a new specialty bread from ARS laboratory ovens contains fine-ground corn flour blended with wheat bread flour. Its delicate corn flavor and rich

golden color set it apart from conventional white and whole wheat breads. Added wheat gluten gives the new bread its "sandwichy" texture, which is coarser than that of conventional white breads. And the dough is leavened with yeast instead of the baking powder used with regular cornbread. The new bread resulted from research requested by the American Corn Millers Federation. A research formulation, designed for professional bakers, is available. Vegetable Oil Research, Northern Regional Research Center, Peoria, IL
Kathleen A. Warner, (202) 447-6633

Carbonated milk may become a nutritious alternative to soft drinks. Scientists have made two types of this carbonated drink--one mixed with filtered apricot juice, the other with artificial strawberry flavoring. They bubbled carbon dioxide gas through a mixture of water, nonfat dry milk, juice or flavoring, and other ingredients. Refrigerated, the juice mixture stayed fresh 2 to 3 months; the flavored drink, up to 6 months. Commercial companies are interested in making such drinks, which would contain calcium and protein and create a new market for surplus nonfat dry milk. Food/Feed Processing Research, Southern Regional Research Center, New Orleans, LA
Ranjit S. Kadan, (504) 286-4332

A new cotton fiber promises to improve durable-press cotton's resistance to wear. The fiber, a rare crystalline form of cellulose derived from native cotton, is called Cellulose III. It is also permeable to dyes, pigments, and other textile chemicals. To convert plain cotton cellulose to Cellulose III, lab technicians treat it with ammonia vapors at high temperature and pressure until its crystalline structure changes. The changes in geometric configuration can be observed by X-ray diffraction. The new form of cellulose adds strength to durable-press cottons. Inexpensive lab techniques to produce these new crystalline substances are under study. Fiber Quality Research, Southern Regional Research Center, New Orleans, LA
Timothy A. Calamari/Lawrence Yatsu, (504) 286-4265

Food (and Water) Freshness and Safety

Ordinary soap made from animal fats and lye is a safe and effective cleanser that biodegrades quickly. Without modification, however, it washes poorly in cold and hard water. ARS scientists have modified soap by blending it with other fat-derived surfactants, called lime soap-dispersing agents, to form new, highly effective household laundry detergents. These soap-based detergents contain no phosphates; are nontoxic to humans, animals, and algae; and biodegrade rapidly and completely. Normal waste treatment and disposal systems can easily digest them to harmless effluent. They work well in hard, soft, cold, and hot water. And they equaled or outperformed the most effective household detergents on the U.S. market in various tests. Manufacturers abroad are making laundry detergents, dishwashing liquids, and toilet soaps using this technology. Animal Biomaterial Research, Eastern Regional Research Ctr., Philadelphia, PA
Stephen Fearheller, (215) 489-6585

Toxoplasma parasites, well-known to infect humans, sheep, goats, and cats, have been found to persist in pigs. The discovery of resting-stage cysts of Toxoplasma gondii in swine could broaden the understanding of the single-cell parasite's role in disease transmission. Pregnant women who get toxoplasmosis give birth to approximately 3,300 infected infants each year in the United States. ARS scientists, working toward a vaccine for sheep, found that T. gondii cysts remained alive in edible tissues of sows up to 865 days after infection, or practically the life of a pig. Three days of freezing killed most of the cysts in commercial cuts of pork. (Thorough cooking will kill the rest.)
Protozoan Diseases Lab, Beltsville, MD
Jitender P. Dubey, (301) 344-2128

Pesticide concentrations in groundwater in many parts of the country may be less a problem under typical farming conditions than first thought. That's the conclusion from a 2-year sampling of 20 wells in a diversified small family farm

area in central Pennsylvania. Of nine pesticides tested for, only three were found, and these at extremely low concentrations. The nation's most widely used weed-killer, alachlor, was not present. However, traces of atrazine, a herbicide popular with corn farmers, showed up in most wells despite the fact that the chemical is used relatively sparingly in the watershed tested.

Northeast Watershed Research Lab,
University Park, PA
Harry B. Pionke, (814) 865-2048

The day is not far off when apples will no longer tempt the apple maggot. That's the hope of ARS scientists working to determine why an apple line they developed repels the maggot, named Rhagoletis pomonella. Researchers determined that the resistant apples produce chemicals that result in the apple being unacceptable to the insect; their next step is to transfer this resistance trait to new or existing apple varieties. The result could be maggot-free apples with less need for pesticides. Growers now apply three to five chemical sprays per season to battle the maggot, long a serious pest in the Northeast and Midwest east of the Mississippi River--and a recent arrival in the Pacific Northwest.

Insect and Weed Control Research,
West Lafayette, IN
Hilary F. Goonewardene, (317) 494-4607

New wax beans can fight off 33 races of bean rust disease. With less disease, these and other super-rust-resistant beans could reduce farmers' need to spray pesticides and thus cut pesticide residue in the environment. Rust, one of the most damaging bean leaf diseases, costs farmers up to \$250 million yearly. The rust fungus, Uromyces appendiculatus, is a genetic quick-change artist that can develop new strains to attack bean varieties bred to resist certain races of it. So scientists are breeding resistance to more than 30 rust races into each common bean that rust can kill--snap, wax, pinto, navy, pink, black, red Mexican, and great northern beans. Since 1984, ARS and the New Jersey and Florida state experiment stations have released 17

super-rust-resistant snap and wax beans to commercial breeders.

Microbiology and Plant Pathology Lab,
Beltsville, MD
Rennie Stavely, (301) 344-3600

Chinese peasants farming their land have used it for hundreds of years; now farmers here could use root bark powder from the Chinese bittersweet bush to cut losses from pests. In lab tests done with a cooperating scientist from China, the powder dramatically reduced the body weight of fall armyworm caterpillars. Scientists think the powder either repels caterpillars so they won't eat or somehow paralyzes their stomachs so they can't digest. Either way, it greatly reduces damage by these pests and, according to studies outside the agency, other grain and vegetable pests. The chemical structure of one active component of the powder has been determined by ARS scientists and could now be synthesized by chemical companies to make a safe antifeedant in crop fields.

Insect Chemical Ecology Lab,
Beltsville, MD
Nobel Wakabayashi, (301) 344-1102

Natural bacteria living in some types of soil can help clean groundwater contaminated by nitrate. The product of nitrogen compounds in fertilizer, animal waste, and other sources can sometimes leach through the soil, polluting groundwater. But some bacteria can change nitrate into nitrous oxide or dinitrogen gases that harmlessly disperse. In cooperation with the U.S. Geological Survey, ARS scientists conducted tests that showed this occurring in a sandy-clay aquifer in the Coastal Plains of Georgia. Scientists are looking for ways to boost bacteria's usefulness as a way to reduce groundwater pollution.

Southeast Watershed Research Lab,
Tifton, GA
Richard Lowrance, (912) 386-3514

The Briefs is published quarterly in January, April, July, and October. For further information or addition to the mailing list, contact Judy McBride, ARS Nutrition Editor, at (301) 344-4095; or write to me at ARS Information, Bldg. 005, BARC-West, Beltsville, MD 20705.